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THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY, DIVISION OF MYCOLOGY AND DISEASE SURVEY
BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING
AGRICULTURAL RESEARCH ADMINISTRATION
UNITED STATES DEPARTMENT OF AGRICULTURE

Volume XXIX February 7, 1945 Number 4

The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. The reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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CROWNGALL OF HOPS[1]

G. R. Hoerner[2]

A brief account of the economic importance of crowngall of hops was published in 1934 (3). At that time, artificial inoculation experiments were initiated to determine the host range of the causative organism, Agrobacterium tumefaciens (E. F. Sm. & Town.) Conn, obtained from hops, with particular reference to botanical species and horticultural varieties of the genus Humulus and closely related host genera.

Despite the fact that plant material of not all reported hosts of crowngall has been available, a considerable amount of unpublished data has accumulated since 1934 and a number of previously unreported hosts have been discovered.

The host plants represent a wide range of forms from all parts of the world. Most of the identifications relate to well known species and are probably correct.

The sources from which many of the host names were obtained are indicated (1, 2). Names of species of Sedum, involving recently described forms of a critical group, were obtained from Praeger (4).

Many of the names are those under which plants were found growing in greenhouses, botanical gardens, or arboretums, and consequently can not be regarded as necessarily correct, although they probably are so in most cases.

Methods

Isolations from a gall on hops were first made in 1934 and maintained, by necessary transfers, on slants of potato-dextrose agar.

In making inoculations of prospective host plants, sterile water was added to the culture, the test tube thoroughly shaken and allowed to stand for a short time before the resultant liquid inoculum was drawn off into a hypodermic syringe. The inoculum was then introduced into the plant tissues by means of a needle puncture. This method was found to be much more satisfactory than the more common procedures of making the puncture with a dissecting needle through a loopful of inoculum or of introducing the inoculum into a scalpel wound.

It is of passing interest to note that the age of the cultures employed apparently had less bearing on resultant infection than the age and growth activity of the tissues of the hosts inoculated. Young, actively growing tissues were, in most instances, most readily infected.

Attenuation of the cultures was not pronounced if transfers were made before the medium was entirely desiccated. As a result of this observation, the age of the cultures employed was not recorded.

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1 Published with the approval of the Director, Oregon Agricultural Experiment Station, as Technical Paper No. 433. Contribution of the U. S. Department of Agriculture and the Oregon Agricultural Experiment Station Cooperating.

2 Agent (Pathologist), Division of Drug and Related Plants, Bureau of Plant Industry, Soils and Agricultural Engineering.

A sufficient number of check punctures were made to produce macroscopic evidence that resultant galls formed were due to the organism introduced and not to mechanical injury by the needle. Specimen galls in most instances were preserved for further histological examination.

Host plants were grown in the greenhouse where inoculations were made, galls developed, and observations taken. The vegetative condition of the host plants may have had an influence on the rapidity of the response to infection and consequent gall formation. Evidence of incipient gall formation was not recorded.

The time elapsed between inoculation and the recording of gall formation does not necessarily represent the shortest period required for gall formation to occur. When no infection resulted, as evidenced by gall formation, the longest period of time any of the inoculations were under observation is indicated.

It should be noted that in the case of the Cactaceae, there was a pronounced reaction to the inoculum on the part of most of the inoculated plants. Tissue in the immediate vicinity of the punctures was commonly killed and the progress of possible infection by the invading organism thus effectively checked.

Results of Inoculations

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Aceraceae	Acer macrophyllum Pursh.	Stem	8	1	48
Anacardiaceae	Mangifera indica L.	"	7	1	87
	Schinus dependens Ort.	"	14	2	62
Anonaceae	Annona cherimola Mill.	"	4	0	300
Apocynaceae	Allamanda cathartica L.var. hendersonii (Bull) Raffill	"	9	8	68
Balsaminaceae	Impatiens balsamina L.	"	7	7	34
Begoniaceae	Begonia sp. SCHMIDT'S IDEAL FIBROUS-ROOTED BEGONIA	"	6	1	41
	TUBEROUS-ROOTED BEGONIA	Stem	1	0	76
		Petiole	3	3	57
Betulaceae	Alnus oregana Nutt.	Stem	4	1	343
	Corylus avellana L.	"	12	6	91
Cactaceae	*Carnegiea gigantea (Engelm.) Britton & Rose	"	8	0	203
	Opuntia ammophila Small	"	17	1	183
	O. basilaris Engelm.& Bigel.	"	16	1	293
	O. dillenii (Ker) Haw.	"	21	0	517
	O. ficus-indica (L.) Mill.	"	16	0	628
	O. humifusa Raf.	"	10	0	752
	O. keyensis Britton	"	19	0	478
	O. lindheimeri Engelm.	"	20	0	672

*One gall developed after record of elapsed time had been lost.

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
	(Opuntia)				
Cactaceae (Cont'd)	O. microdasys (Lehm.) Pfeiff. var. rufida K. Schumann	Stem	28	0	628
	O. vulgaris Mill.	"	25	0	682
	O. polyacantha Haw.	"	11	0	473
	O. stricta Haw.	"	15	0	477
	O. tomentosa (Link) Salm-Dyck	"	28	0	1122
Caprifoliaceae	Lonicera sp.	"	40	0	219
Caryophyllaceae	Dianthus caryophyllus L.	"	6	2	71
	RADIOLITE CARNATION	"	9	0	65
Chenopodiaceae	Beta vulgaris L. var. crassa Alef. DETROIT DARK RED				
	CANNERS FAVORITE BEET	Crown	2	2	36
		Stalk**	3	3	25
		Stem	4	4	17
	SUGAR BEET	"	5	5	26
Commelinaceae	Tradescantia sp.	"	28	0	190
Compositae	Calendula officinalis L. DOUBLE ORANGE KING MARIGOLD	"	6	6	36
	Chrysanthemum frutescens L.	"	17	0	193
	C. morifolium Ram.	"	25	0	195
	Dahlia sp. ORANGE DOUZON DAHLIA	"	31	0	155
	Helianthus annuus L. COMMON SUNFLOWER	"	12	5	31
	DWARF DOUBLE YELLOW ANNUAL HELIANTHUS	"	4	1	26
Crassulaceae	Bryophyllum pinnatum (L.f.) Kurz	"	5	5	30
	Crassula monticola N.E. Br.	"	1	1	223
	Kalanchoë daigremontiana Ham. & Perr.	"	6	2	46
	Sedum acre L.	"	4	4	64
	S. adolphi Hamet	"	2	2	29
	S. aizoon L.	"	5	3	45
	S. alboroseum Baker	"	3	3	45
	S. alboroseum Baker var. variegatum (Mast.) Hubb.	"	2	2	29
	S. album L.	"	13	13	28
	S. allantoides Rose	"	3	1	210

**Flower stalk

Family	Host (Sedum)	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Crassulaceae (Cont'd)	S. anglicum Huds.	Stem	5	1	80
	S. anopetalum DC.	"	7	2	45
	S. brevifolium DC.	"	2	1	29
	S. chaneti Lev.	"	1	1	210
	S. cruentum Hort.	"	4	1	83
	S. dasyphyllum L.	"	5	5	42
	S. divergens S. Wats.	"	9	2	50
	S. douglasii Hook.	"	3	3	44
	S. ellacombianum Praeger	"	2	2	29
	S. ewersii Ledeb.	"	3	3	25
	S. floriferum Praeger	"	7	2	65
	S. hispanicum L.	"	3	2	29
	S. hybridum L.	"	1	1	29
	S. intermedium Rupr.	"	3	3	44
	S. lineare Thunb.	"	3	3	29
	S. lineare f. variegatum Praeger	"	2	2	61
	S. lydium Boiss.	"	3	3	29
	S. maximum (L.) Hoffm. & Suter var. haematodes Mast.	"	1	1	44
	S. mexicanum Britton	"	2	1	41
	S. monregalense Balb.	"	3	2	29
	S. moranense H. B. K.	"	1	1	59
	S. murale Hort.	"	2	2	26
	S. nevii A. Gray	"	2	2	29
	S. nicaeense All.	"	4	4	29
	S. oreganum Nutt.	"	12	5	44
	S. pachyphyllum Rose	"	4	4	36
	S. palmeri S. Wats.	"	6	1	78
	S. populifolium Pall.	"	1	1	29
	S. pulchellum Michx.	"	7	4	50
	S. reflexum L.	"	3	3	29
	S. reflexum var. cristatum Mast.	"	7	1	99
	S. rupestre L.	"	5	4	103
	S. sarmentosum Bunge	"	2	2	25
	S. sexangulare L.	"	5	3	59
	S. sieboldii Sweet	"	2	1	61
	S. spathulifolium Hook.	"	2	2	44
	S. spathulifolium var. purpureum Praeger	"	3	2	42
	S. spectabile Bor.	"	4	1	33
	S. stahlii Solms	"	2	2	104
	S. stoloniferum Gmel.	"	5	5	35
	S. stoloniferum var. coccineum Hort.	"	3	3	44
	S. stribrnyi Velen.	"	2	2	29

Family	Host (Sedum)	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Crassulaceae (Cont'd)	S. ternatum Michx.	Stem	5	2	78
	S. treleasei Rose	"	1	1	57
	S. winkleri (Willk.) Wolley Dod	"	2	0	209
	S. yosemitense Britton	"	8	5	97
	Sempervivum sp.	"	1	1	44
Cruciferae	Brassica oleracea L. var. botrytis L. DANISH DRY WEATHER CAULIFLOWER	"	3	3	12
	SNOW BALL CAULIFLOWER	"	4	4	50
	B. oleracea L. var. capitata L. EARLY JERSEY WAKEFIELD CABBAGE	"	4	2	12
	B. rapa L.	Stalk	3	2	9
		Stem	3	2	33
	PURPLE TOP WHITE GLOBE TURNIP	Crown	3	3	45
		Stem	4	1	27
	Matthiola incana (L.) R. Br. var. annua (L.) Voss	"	6	6	15
	M. bicornis DC.	"	12	6	32
	Radicula armoracia (L.) Robinson	Crown	1	1	89
		Petiole	24	0	107
	Raphanus sativus L.	Stem	4	4	20
Cucurbitaceae	Citrullus vulgaris Schrad. KLONDYKE WATERMELON	"	17	11	20
	Cucumis melo L. var. cantalupensis Naudin. LARGE YELLOW CANTALOUPE	"	20	15	38
	C. melo var. culta Kurz. HONEY DEW MELON	"	4	4	20
	C. sativus L. DAVIS PERFECT CUCUMBER	"	16	16	20
	EARLY WHITE SPINE CUCUMBER	"	3	0	169
	LEMON CUCUMBER	"	8	8	20
Ebenaceae	Diospyros kaki L.	"	6	1	58
Ericaceae	Arbutus unedo L.	"	9	4	147
	Vaccinium ovatum Pursh	"	27	0	535
	V. parvifolium Smith	"	8	0	309
Euphorbiaceae	Manihot glaziovii Muell. Arg.	"	8	2	64
	Ricinus communis L.	"	5	5	14

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Fagaceae	Castanea dentata (Marsh.) Borkh.	Stalk	3	0	97
		Petiole	5	0	122
		Stem	6	2	97
	Quercus palustris Muench.	"	6	0	648
	Q. phellos L.	"	6	0	171
	Q. rubra L.	"	7	0	543
	Q. velutina Lam.	"	13	0	556
Geraniaceae	Erodium cicutarium (L.) L'Hér.	Crown	3	1	36
		Stem	3	3	20
	Geranium carolinianum L.	Crown	3	3	19
		Stem	2	2	35
	G. dissectum L.	"	4	4	25
	G. molle L.	Crown	3	0	23
	Pelargonium domesticum Hort. EASTER GREETING PELARGONIUM	Stem	7	5	42
	P. zonale Willd.	"	4	2	57
Juglandaceae	Carya illinoensis (Wang.) K. Koch ALLEY PECAN	"	3	0	191
	MONEYMAKER	"	3	1	143
	MOORE	"	6	0	250
	VAN DEMAN	"	4	0	250
	Juglans hindsii Sarg.	"	10	6	36
	J. nigra L.	"	3	3	70
	J. regia L.	"	7	1	122
	Pterocarya stenoptera DC.	"	9	3	51
Labiatae	Coleus blumei Benth.	Crown	1	1	129
		Stem	5	1	129
	Salvia splendens Ker-Gawl. SCARLET SAGE	"	57	0	395
Lauraceae	Persea americana Mill.	"	6	2	72
Leguminosae	Lathyrus odoratus L.	"	12	8	43
	Medicago sativa L.	"	30	0	129
	Phaseolus vulgaris L. KENTUCKY WONDER BEAN	"	12	0	134
	Pisum sativum L. AMERICAN WONDER GARDEN PEA	"	17	10	20
	Prosopis chilensis (Mol.) Stuntz	"	8	1	87
	P. glandulosa Torr.	"	7	0	250
	P. pubescens Benth.	"	6	0	96
	Trifolium pratense L.	"	3	3	19

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Malvaceae	Althaea rosea (L.) Cav.	Crown	6	0	486
		Petiole	15	0	557
	Gossypium barbadense L. AMERICAN PIMA (EGYPTIAN) COTTON	Stem	2	0	186
	SEABROOK (SEA ISLAND) COTTON	"	8	0	186
	G. hirsutum L. AMERICAN UPLAND COTTON	"	7	0	186
	G. sp.	"	2	0	64
	Hibiscus moscheutos L.	"	35	0	168
	H. vitifolius L.	"	10	4	283
	Sidalcea sp.	Bud	3	0	48
		Stem	2	0	92
Meliaceae	Melia azedarach L.	Crown	3	0	543
		Stem	24	0	246
	M. azedarach var. umbraculiformis Berckm.	"	5	0	284
Moraceae	Cannabis sativa L. CHINAMINGTON HEMP	Crown	6	2	18
		Stem	12	12	19
	CHINGTON	"	13	9	22
	KYMINGTON	"	8	8	22
	TOCHIGI	Crown	2	2	17
		Petiole	2	2	17
		Stem	6	6	21
	WISCONSIN NO. 371 (WILD NATIVE STOCK)	"	4	4	18
	WISCONSIN NO. 372 (ROUMANIAN)	"	2	1	18
	WISCONSIN NO. 378 (FARRAMINGTON)	"	1	1	18
	Ficus carica L.	Crown	14	9	36
		Petiole	28	9	96
		Stem	6	2	84
	F. elastica Roxb.	Crown	1	1	94
		Petiole	3	1	78
		Stem	1	0	119
	F. pandurata Hort. (not Hance)	Crown	1	0	176
		Petiole	5	0	176
		Leaf	3	3	116
	Maclura pomifera (Raf.) Schneid.	Crown	3	0	100
		Stem	39	1	272
	Humulus japonicus Sieb.& Zucc.	"	1	1	43

Family	Host (Humulus)	Structure Inoculated	No. Inoculations	No. Calls	Days Elapsed
Moraceae (Cont'd)	H. japonicus var. variegatus Hort.	Stem	1	1	38
	H. lupulus L. AUSCHER				
	ROT HOP	"	1	1	108
	BAVARIAN	"	6	4	25
	BELGIAN NO. 1	"	1	1	68
	BELGIAN NO. 21	"	1	1	103
	BELGIAN FUGGLES	"	2	1	103
	BREWER'S FAVOURITE	"	10	2	37
	BREWER'S GOLD	"	7	3	83
	BRITISH COLUMBIA GOLDING	"	4	0	92
	BULLION	"	3	1	88
	BURGUNDER	"	3	0	163
	CATS'-TAILS	"	2	0	114
	CZECHOSLOVAKIA	"	2	1	114
	EARLY CLUSTERS	"	6	4	25
	EARLY GREEN	"	3	0	40
	EARLY PROMISE	"	1	1	47
	EAST KENT GOLDING	"	4	3	29
	ELSASSER	"	1	1	67
	FILLPOCKET	"	1	1	47
	FUGGLES	"	10	8	22
	GOLDEN CLUSTER	"	2	0	41
	GOLDING	"	14	0	354
	JONES NO. 1	"	2	1	92
	JONES NO. 2	"	5	2	68
	KENT GOLDING	"	15	2	46
	LANDHOPFEN	"	2	0	40
	LATE CLUSTERS	"	11	8	34
	MILLSTATE	"	1	0	41
	MITTLEFRÜHE HALLERTAUER	"	2	1	105
	MÜHLVERTLER GRÜNE	"	3	0	163
	PATTERSON	"	2	2	108
	QUALITY	"	1	0	68
	R1/9	"	1	1	47
	RED VINES	"	17	1	109
	SAMLING	"	2	2	50
	SEMSCH	Stem	1	1	59
	SPALT	"	1	1	62
	SPÄLTER	"	8	5	59
	TETTNANGER FRÜH	"	1	0	163
	TIGE BLANCHE	"	1	0	163
	VERTE	"	3	1	53
	H. lupulus L. var. neo-mexicanus Nels. & Ckll.	"	7	6	77
	H. sp. (native from Japan)	"	4	0	40

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Moraceae (Cont'd)	Morus alba L.	Crown	4	1	193
		Stem	18	1	104
	M. alba var. tatarica Loud.	Crown	2	1	71
		Stem	23	3	104
Myrtaceae	Eucalyptus melliodora A. Cunn.	"	5	0	346
Oleaceae	Forsythia ovata Nakai	"	14	0	259
	Ligustrum sp.	"	38	0	304
Onagraceae	Fuchsia speciosa Hort. PURPLE TRAILING QUEEN FUCHSIA	"	7	7	28
Oxalidaceae	Oxalis oregana Nutt.	Crown	7	0	161
		Stalk	2	0	44
		Petiole	8	0	44
		Stem	16	0	161
	O. suksdorfii Trel.	"	5	5	59
	O. trilliifolia Hook.	Crown	1	0	43
		Petiole	4	2	43
Passifloraceae	Passiflora edulis Sims var. flavicarpa Hort.	Stem	25	0	582
Pinaceae	Cupressus arizonica Greene	"	3	1	135
Polemoniaceae	Phlox drummondii Hook. SCARLET PHLOX	"	11	0	87
	P. sp.	"	10	3	42
Polygonaceae	Rumex conglomeratus Murr.	Stalk	3	0	46
		Petiole	6	6	20
	R. crispus L.	Stem	3	0	93
Proteaceae	Grevillea robusta A. Cunn.	"	12	0	366
Ranunculaceae	Clematis ligusticifolia Nutt.	"	23	0	206
	Paeonia sp.	"	2	0	119
Resedaceae	Reseda odorata L.	"	9	9	7
Rosaceae	Malus baccata (L.) Borkh.	"	8	4	55
	Malus pumila Mill. BEN DAVIS	"	4	1	106
	CORTLAND	"	4	1	106
	MCINTOSH	"	3	0	411
	SCOTT WINTER	"	9	1	106
	Prunus americana Marsh.	"	4	0	25
	P. amygdalus Batsch	"	1	0	235
	P. avium L.	"	3	3	49

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
	(Prunus)				
Rosaceae (Cont'd)	P. lusitanica L.	Stem	8	1	147
	Pyrus communis L.	"	3	2	59
	D'ANJOU	"	5	0	141
	Rosa chinensis Jacq.	"	9	9	20
	Rubus allegheniensis Porter				
	JOY	"	27	2	38
	STUART	Petiole	3	2	71
		Stem	7	7	26
	R. coreanus Miq.	"	12	1	112
	R. crataegifolius Bunge	"	4	3	87
	R. flagellaris Willd. LUCRETIA	"	12	0	219
	R. flagellaris var. geophilus (Blanchard) Bailey				
	AUSTIN THORNLESS	"	18	0	276
	R. idaeus L. ANTWERP	"	3	2	36
	LA FRANCE	"	4	2	36
	LLOYD GEORGE	"	3	3	18
	RANERE	"	12	12	18
	R. laciniatus Willd.				
	OREGON EVERGREEN	"	20	1	72
	R. lasiococcus A. Gray	"	4	2	76
	R. leucodermis Douglas	"	6	2	60
	R. loganobaccus Bailey YOUNG	"	16	1	70
	LOGANBERRY	"	3	3	36
	R. macropetalus Dougl.	"	17	0	317
	R. probabilis Bailey				
	NANTICOKE	"	11	1	129
	R. strigosus Michx. CHIEF	"	5	2	92
	CUTHBERT	"	3	1	54
	FEWTHORN	"	6	6	17
	ULSTER	"	5	1	68
	VIKING	"	5	2	25
	R. thyrsoideus Wimm.	"	35	1	150
	R. thyrsoideus x R. titanus				
	Brainerd	"	13	1	118
	R. sp. IDEAL WILD	"	15	2	150
	JUNE	"	8	4	91
	KOSMO	"	11	1	87
	MARLBORO	"	7	6	106
	NEWBURGH	"	1	1	68
	N. Y. 2584	"	5	5	18
	N. Y. 3024	"	4	2	91
	N. Y. 3041	"	9	4	77
	N. Y. 5555 -- TAYLOR RED RASPBERRY	"	8	8	87
	POTOMAC	"	2	1	87
	SANTIAM	"	11	1	254
	SODUS	"	2	2	40

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Rosaceae (Cont'd)	Rubus sp. (cont'd.)	Stem			
	SUCRE DE METZ	"	2	1	43
	SURPRASSE MERVILLE ROUGE	"	1	1	36
	U. S. 231	"	4	3	68
	ZELINSKI	"	16	2	154
	NO. 120 ZELINSKI X LOGAN	"	5	1	92
	NO. 164 ZELINSKI X LOGAN	"	3	1	87
	NO. 177 ZELINSKI X LOGAN	"	5	1	70
	NO. 178 ZELINSKI X LOGAN	"	13	2	185
	NO. 181 ZELINSKI X LOGAN	"	6	1	304
	NO. 244 ZELINSKI X LOGAN	"	4	1	226
	NO. 247 ZELINSKI X LOGAN	"	5	1	87
Rutaceae	Citrus grandis (L.) Osbeck	"	10	1	68
	C. limon Burm. f. EUREKA LEMON	"	8	0	484
Salicaceae	Populus nigra L. var. italica Du Roi	"	12	4	62
	P. sp.	"	5	0	80
	Salix matsudana Koidz. forma umbraculifera Rehd.	"	5	5	23
	S. vitellina L.	"	5	5	73
	S. sp.	"	8	4	100
Solanaceae	Datura stramonium L.	"	10	10	14
	D. tatula L.	"	6	6	29
	Lycopersicon esculentum Mill. INDIANA CANNER TOMATO	Crown	2	2	31
		Petiole	2	2	17
		Stem	16	16	10
	Nicotiana acuminata (Graham) Hook.	"	4	4	34
	N. alata Link & Otto	"	16	1	190
	N. glauca Graham	"	3	2	33
	N. glutinosa L.	"	10	10	10
	N. paniculata L.	"	8	7	51
	N. quadrivalvis Pursh	"	10	10	17
	N. repanda Willd. ex Lehm.	"	3	3	34
	N. rustica L.	"	4	4	38
	N. suaveolens Lehm.	"	22	2	40
	N. sylvestris Spegaz.	"	15	9	20
	N. tabacum L.	Petiole	2	0	53
		Stem	15	11	22
	CONNECTICUT BROAD LEAF TOBACCO	"	15	3	123
	N. tabacum var. angustifolia Comes	"	10	8	21

Family	Host	Structure Inoculated	No. Inoculations	No. Galls	Days Elapsed
Solanaceae (Cont'd)	Petunia sp. ROSY MORNING PETUNIA	Stem	10	1	53
	Solanum tuberosum L. BLISS TRIUMPH POTATO	"	9	8	8
Tropaeolaceae	Tropaeolum majus L.	"	21	11	60
Ulmaceae	Celtis mississippiensis Bosc.	Crown	8	1	158
		Stem	46	5	72
	C. occidentalis L.	Crown	6	0	157
		Stem	23	3	102
	C. sinensis Pers.	"	40	0	680
	C. tournefortii Lam.	Crown	1	0	84
		Stem	7	0	186
	Ulmus americana L.	Crown	4	0	239
		Stem	26	5	116
	U. pumila L.	Crown	2	0	162
		Stem	6	6	92
	U. thomasii Sarg.	"	9	0	252
Umbelliferae	Daucus carota L.	Crown	4	4	82
		Stalk	1	0	51
		Petiole	3	3	8
	Pastinaca sativa L.	Stalk	4	0	62
		Petiole	14	4	47
Urticaceae	Urtica lyallii S. Wats.	Crown	3	0	68
		Stem	74	0	145
Verbenaceae	Verbena hybrida Hort.				
	MAMMOTH FLOWERING VERBENA	"	2	2	37
	SALMON PINK VERBENA	"	6	6	41
Vitaceae	Parthenocissus quinquefolia (L.) Planch	"	23	0	148
	Vitis labrusca L. FOX or SKUNK GRAPE	"	7	0	145
	CONCORD GRAPE	"	1	0	192
	MOORE EARLY GRAPE	"	2	0	194
	V. labrusca x V. vinifera NIAGARA GRAPE	"	3	0	192
	V. vinifera L. GOLDEN MUSCAT GRAPE	"	5	0	192
	V. sp. SHERIDAN GRAPE	"	1	0	186
	VARIETY UNKNOWN	"	2	0	138

SUMMARY

Two thousand nine hundred fifty-eight inoculations were made with cultures of the crown gall organism obtained from hops, on 210 named species of plants representing 94 genera and 48 familes.

Galls resulted on 157 species representing 71 genera and 37 familes.

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DIVISION OF DRUG AND RELATED PLANTS

FUNGI ASSOCIATED WITH DECLINE OF AVOCADO AND CITRUS IN CALIFORNIA (III)

James V. Harvey

During the 10-month period ending December 31, 1944, visits were made to many declining or collapsing, as well as healthy, avocado and citrus groves in California. Tree rots and soil samples were taken, on repeated trips, from ever-widening circles in the majority of these groves. Data were recorded on the appearance of selected trees and on soil conditions. Perceptible changes in previously assigned tree values were noted.

Some evidence has been obtained that would indicate the spread of disease in avocado from a sickened area to one with healthy trees, especially when soil drainage is poor and the proper organism is present. (In avocado, decline is more common on heavier soils or on shallow soils underlaid by a more impervious layer.) In citrus, the evidence of spread is less convincing, though existent.

Avocado Decline.

Of 438 diseased avocado trees sampled, i.e., whose roots were incised aseptically and placed upon corn meal agar plates, 240 (55%) of the individuals yielded the fungus Phytophthora cinnamomi, whereas 198 did not. The latter group included several dead trees and others in the last stages of decline. (P. cinnamomi is procurable more commonly from living superficial tissues in distressed zones of dying roots; the author has not been able to isolate the fungus directly from the soils). It is quite probable that many of the apparently declining trees owe their symptoms to improper methods of culture, such as the cutting of surface roots as a result of over-cultivation of shallow soils, to insufficient water supply, etc.

Of 442 healthy trees examined, 352 (80%) did not produce the fungus in culture. All but a few of the 90 trees whose roots yielded P. cinnamomi were located in declining groves, among or near distressed individuals. At first appearing non-diseased, some of the trees in this group developed symptoms of decline later.

Table 1. Incidence of Phytophthora cinnamomi, Pythium vexans, and P. ultimum in Cultures from Roots of Healthy and Declining Avocado and Citrus Trees in California 1944

County	Presence[a] of fungus in cultures from Declining trees +	Declining trees -	Healthy trees +	Healthy trees -
AVOCADO: Phytophthora cinnamomi				
San Diego	102	66	19	108
Los Angeles	65	60	59	133
Orange	26	28	6	8
Ventura		2		2
Santa Barbara	47	38	6	64
San Luis Obispo		4[b]		7
Santa Cruz				12
Santa Clara				4
Tulare				4
Miscellaneous				10
Total	240	198	90	352
AVOCADO: Pythium vexans				
San Diego	58	110	34	93
Los Angeles	70	55	79	113
Orange	30	24	6	8
Ventura	2			2
Santa Barbara	43	42	24	46
San Luis Obispo		4[b]		7
Santa Cruz				12
Santa Clara				4
Tulare				4
Miscellaneous				10
Total	203	233	143	299
LEMON: Pythium ultimum				
San Diego	22	20	4	8
Santa Barbara	20	17	8	8
Ventura	0	0	0	1
Los Angeles	0	0	2	0
Scattered (mostly north)	0	1	0	11
	45	38	14	28
VALENCIA ORANGE: Pythium ultimum				
San Diego			5	3
Los Angeles	61	53	33	57
Orange	0	0	1	4
Santa Barbara	2	2	0	0
Miscellaneous (Scattered)	0[c]	3	0	4
	63	58	39	68
NAVEL ORANGE: Pythium ultimum				
San Diego	1	7	0	1
Los Angeles	0	1	2	1
Miscellaneous (Scattered)	0[c]	14	0	30
	1	22	2	32
OTHER CITRUS (see text): Pythium ultimum	3	5	0	5
Total Citrus: P. ultimum	112	123	55	133

[a] (+) Fungus indicated obtained in cultures; (-) not obtained
[b] Possibly not true decline, trees showed evidence of improper care.
[c] All samples from miscellaneous groves were taken north of the Tehachapi Mountains.

Table 1 gives the distribution of P. cinnamomi by counties. The proportions have not changed perceptibly from those of previous reports by the writer (1944), when fewer cases were given. The plus sign (+) indicates that P. cinnamomi was present and the minus (-) that it failed to appear in culture.

Records are available on each grove visited. In many individual instances, the evidence is more striking.

Pythium vexans continues to be prevalent in isolations from avocado roots. With the one exception of a healthy Valencia orange tree, this fungus has not been taken by the author from any other source during the period of this survey. Although its incidence is actually higher in declining avocado trees in some groves, the fungus appears to be a "rider" rather than a pathogen. However, its parasitic habit should be more fully investigated. P. vexans is reported from many other hosts (Middleton, 1943).

Pythium vexans has been isolated from avocado as indicated in Table 1.

Species of Phytophthora obtained infrequently, not necessarily associated with decline, are P. parasitica and P. cactorum. Species of Pythium identifiable, other than P. vexans, are P. ultimum, P. anandrum, P. debaryanum, and P. monosperum.

Much to the writer's surprise, a species of true water mold, Achlya pacifica Harvey (Harvey, 1942), was obtained from a diseased avocado root in a grove in Los Angeles County. This species had been procured from the soils of this grove and others on several previous occasions.

Citrus Decline.

No attempt is being made in this survey to distinguish between "slow" decline and "quick" decline, one or the other being often evident in certain orchards. Thus far, no causative organism has definitely been associated with decline. Species of Phytophthora have been isolated but seldom and without significant distribution. Trichoderm lignorum has appeared frequently in both diseased and healthy roots. Fusarium spp. have been present in about 98% of all cases. Pythium spp., other than P. ultimum, have been few.

Owing to its high degree of frequency in appearance, in slightly higher proportions in ailing lemon and Valencia orange, Pythium ultimum might be considered worthy of further investigation as a possible causative agent of decline in Citrus species.

Other types of citrus include grapefruit, tangerine, lime, sour orange, etc. Only a few such specimens were sampled.

Pythium ultimum was distributed on citrus trees as shown in Table 1.

Among the 123 trees described as declining, that did not yield Pythium ultimum, there are possibly some that are not truly declining. Too little is at present known about "decline".

Species that have occurred rarely on citrus include: Phytophthora parasitica, P. cactorum, and P. cinnamomi, Pythium anandrum and P. debaryanum.

In a 10-acre grove in San Bernardino County, consisting of about 3/4 Navels and 1/4 Valencias, many trees have been found to be suffering from foot rot. This disease appears to be spreading in the grove. The grove was earlier classified as "declining", after a few samples had been taken.

The relatively high incidence of Phytophthora citrophthora in this orchard and the almost universal lack of this species in declining groves

elsewhere, plus the fact that most of the trees in the orchard in question are on sweet-orange stock, prompted a more thorough investigation, and the grove is not now classified as one in "decline".

In this grove, Phytophthora citrophthora has been isolated as follows:

	Ailing trees		Healthy trees	
	(+)	(-)	(+)	(-)
Navel oranges	7	13	4	21
Valencia oranges	0	6	1	3
	7	19	5	24

The relative frequency of Pythium ultimum in ailing trees has been higher in this grove than the average elsewhere:

	Ailing trees		Healthy trees	
	(+)	(-)	(+)	(-)
Navel oranges	17	3	9	16
Valencia oranges	2	4	4	0
	19	7	13	16

Summary.

1. There is a high degree of occurrence of Phytophthora cinnamomi in declining avocado trees, in 55% of the cases handled. There is, conversely, a very high percentage (80) of non-declining trees that did not yield this fungus. Almost all of the non-declining fungus-yielding trees (20%) were from decline areas. P. cinnamomi might be considered to be of primary importance in decline, especially when moisture conditions permit its spread.

2. Pythium vexans is found with high frequency in declining avocado groves, although to a less significant degree than the preceding fungus. This species is probably of secondary importance, and worthy of further investigation.

3. In various species of Citrus, especially lemon and Valencia orange, Pythium ultimum occurs frequently enough to suggest that it be investigated further.

4. Phytophthora citrophthora appears to bear no relationship to decline in citrus, it not being bound in cultures from fibrous roots of declining citrus trees. This species is, however, a good "index fungus" in foot-rot.

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EMERGENCY PLANT DISEASE PREVENTION PROJECT

SURVEYS FOR WESTERN X-DISEASE IN UTAH PEACH ORCHARDS

Arthur S. Rhoads

Utah County. A survey of the western X-disease in peach orchards of Utah County was made from September 27 to October 2 with the cooperation and help of the county agent, Mr. Clarence D. Ashton. An attempt was made to recheck a number of orchards that had been surveyed by Dr. S. B. Locke in 1943 in order to get an idea of the increase in incidence of the disease, but this proved difficult since in his survey only portions of various orchards were covered and in most cases it was not known just which parts these were, so that the results of the two surveys are not strictly comparable in all cases.

The 1943 survey, based on 10,051 trees in portions of 33 orchards at various points in Utah County, yielded 122 definite cases and 20 borderline cases of western X-disease, or a total of 2.4%. The 1944 survey, based on 10,735 trees in 24 orchards or different-aged blocks ranging from 8 or 9 to 45 years old and belonging to 13 growers at various points, yielded a total of 355, or 3.3%, with western X-disease.[1] Since the 1944 survey was made largely in older orchards where the disease is most likely to occur the figure of 3.3% appears to represent the maximum incidence of the disease rather than the true average. Orchards under 8 or 9 years of age, where the incidence of the disease in this county ordinarily would be slight, were not included in either survey. In one orchard the 2 trees that showed the disease in 1943 had been removed. In some orchards, where no or but few cases of the disease occurred in 1943, no or but little increase was apparent, while in others increases ranged up to 100%. In one orchard at Genola, where no effort was made to remove diseased trees found in the 1943 survey, the 1944 survey showed that the incidence of the disease increased from 3.4 in 1943 to 11.6% in 1944, or 341%. An analysis of the results of these surveys showed that the incidence of the disease was erratic in different-aged blocks and did not show any correlation with increasing age of trees.

In all the orchards but one surveyed in this county the location of the diseased trees was mapped by the county agent and these trees marked, since most of the growers expressed their interest in removing them in order to reduce the occurrence of the disease to a minimum.

Davis County. In contrast to the low incidence of western X-disease in peach orchards of Utah County, this disease has become so well established in Davis County that eradication would involve the removal of anywhere from 1/4 to 1/2 of the bearing trees in many orchards, and even as high as 80% in a few. A complete eradication program would be ruinous to the growers, and it is unlikely that even such drastic action would eliminate the disease in view of the abundance of western chokecherry growing wild in more or less close proximity to the orchards. This statement is based on the assumption made by some that the same virus is involved in western X-disease of peach and the red-leaf disease of western chokecherry, though this has yet to be established as a fact.

A survey was made during the latter part of September and early October of 22 orchards or blocks of trees belonging to 13 different growers at Woods Cross, Bountiful, Centerville, and Farmington, and ranging in age from less than 5 to 25 years. Six of the blocks included in this survey

[1] Incidence of the disease in both surveys in this county was based solely on the total number of living trees remaining, though losses from it occurred in some of the orchards.

have been under observation by Dr. B. L. Richards since 1939 and 5 others for a lesser period, and it is definitely known that a considerable number of trees now missing in these blocks were removed on account of decline from western X-disease. Most of the other orchards or blocks of trees were surveyed for the first time this year and in some of these trees were missing or had been replanted on account of decline from this disease. In order to make the results of the surveys of the two groups comparable the incidence of the disease in the orchards not previously surveyed also was computed on the basis of the total number of original trees.

Results of survey of western X-disease of peach orchards in Davis County.

Age of trees (years)	No. of trees originally	Trees developing western X-disease	Percentage of incidence of western X-disease.
4 2/3	453	7	1.5
5	100	21	21.0
5 or 6	190	99	52.1
6	488	31	6.4
6	535	70	13.1
6	96	16	16.7
6	128	60	46.9
7	146	18	12.3
7	318	92	28.9
8	168	44	26.2
8	88	33	37.5
8	65	44	67.7
8	127	59	46.5
9	204	99	48.5
11	210	71	33.8
11 or 12	79	24	30.4
13	88	72	81.8
14	107	67	62.6
20	154	72	46.7
20	166	85	51.2
about 20	167	118	70.1
25	247	206	83.4
Total	4324	1408	32.6

Of a total of 4324 trees in these 22 orchards or blocks, 1408, or 32.6%,[2] showed western X-disease and the majority of the attacked trees remaining were severely affected. The increase in incidence of this disease from 1943 to 1944 in 9 blocks for which figures were available last year was 2.9, 4.7, 10.2, 28.6, 39.2, 83.3, 84.4, 90.4, and 94.1%, respectively.

The results of this survey of the incidence of western X-disease in these 22 Davis County orchards are summarized in the above table, from which it is apparent that there is a rapid increase as the plantings increase in age.

Other Areas. While no surveys of the western X-disease have been made in either Box Elder or Weber Counties, both important in peach production in Utah, preliminary observations indicate that it is somewhat

[2] When figured on the basis of the total number of living trees remaining, as was done in Utah Co., the incidence of the disease averaged 25.0% in 14 blocks ranging in age from less than 5 to 25 years.

less prevalent in the former county and much less so in the latter.
EMERGENCY PLANT DISEASE PREVENTION PROJECT

PITHY CHERRY DISEASE OF SOUR CHERRY IN NEW YORK

E. M. Hildebrand

"Pithy Cherry" and "pithy fruit" are the names given by growers to a new disease of Montmorency cherry fruit. It makes the fruit unmarketable and is characterized by the occurrence of several irregularly distributed, dark, corky lesions beneath the skin, which sometimes reach to the depth of the pit. Viewed from the surface or exterior the lesions are depressed and darker in color than the surrounding tissue. Although symptoms have appeared on the green fruit in a few instances, in most cases they become visible and attract attention only after the fruit coloring is well advanced. At maturity the depressions still remain, though less marked with the corky spots darker in color, approaching black. The number of affected trees present in affected orchards ranged from none to 12% in the different rows and the percentages of fruit affected on individual trees ranged up to approximately 50%.

The disease was originally diagnosed as of physiogenic or virus origin, because no microorganisms were associated with the lesions, and both possibilities were explored experimentally. The fact that the pithy-cherry symptoms occur on trees grown on soil types conducive to the occurrence of the boron-deficiency cork disease of apple and pear is circumstantial evidence that this disease, if physiogenic, could be caused by boron deficiency. The common occurrence of virus diseases in New York cherry orchards invited a careful examination of this type of disease agent also. The only other type of a definite deleterious effect on sour cherry fruit in New York is characterized by the symptom of pink or pale red fruit of insipid taste and low sugar content associated with the so-called mottle virus disease present in Niagara County.

In one of the orchards under experiment several of the affected trees were definitely found to be hosts of cherry viruses of which ringspot, Annulus cerasae, was most prevalent. In this instance, ringspot infected approximately 50% of all the trees, including those showing pithy cherry. One pithy-cherry tree was found to be infected by the rosette virus, a disease characterized by low yields, in this orchard. None of the trees affected with pithy cherry were infected by the yellows or greenring yellows viruses.

Indexing one row of orchard trees on small Montmorency trees by grafting as they were breaking dormancy verified the above orchard observations that pithy-cherry trees are sometimes but not always infected by ringspot virus. Similarly, indexing of 3 of the affected orchard trees, 2 of which had ringspot, on apparently healthy young bearing orchard trees, resulted in the production of ringspot symptoms from the 2 known ringspot infected trees. The scions from the affected trees lived and grew and were fruiting during the second and third seasons. Since the pithy-cherry symptoms were not reproduced either on the fruiting scions or on the rest of the trees so grafted, it seems that a virus is not the causal agent. Moreover, the fact that some of the affected orchard trees seemed virus-free according to the indexing tests, is considered good evidence that some other

causal agent is involved.

Early in the spring of 1943 2 fertilizers, borax at the rate of 5 ounces per tree, and muriate of potash at the rate of 2 pounds per tree, were applied criss-cross on part of one experimental orchard where the symptoms had been most prevalent. By this plan some of the trees received both, one or the other, or none, of the extra fertilizers. The fruit crop was light in 1943 and no pithy cherry symptoms were observed in any of the trees. In 1944 with a good cherry crop no symptoms were observed by the grower where the borax had been applied, whereas symptoms were light in the untreated trees, both in this and in neighboring orchards, which suggests but is not proof that this is a boron-deficiency trouble.

DISEASES OF FRUITS AND VEGETABLES IN STORAGE IN NEW YORK

Robert C. Cassell

Apples, pears, onions and carrots were examined in cold and common storages in Brockport, Holley, Albion and Medina (Monroe and Orleans Counties), during the period January 15 to 27.

APPLES: Nineteen lots of apples representing 26,165 bushels were inspected. Ten lots were McIntosh and 9 lots were of other varieties. All were in overhead coil cold storages where the temperature ranged from 31 to 33° F. Ventilation was good in all cases and all lots represented orchard-run picking.

McIntosh:- The 10 lots of McIntosh represented 20,075 bushels. Orchard scab (Venturia inaequalis) was present in all 10 lots, ranging from a trace to 70% with an average prevalence of 16%. Severity averaged light to moderate: There was only one case where the severity ranged from moderate to heavy. This was a lot of 3,318 bushels in the Medina storage. Storage Scab was found in only one lot in Medina, and in one lot in Albion. Prevalence was 5 and 6% and the severity very light.

Blue mold (Penicillium expansum) was found in 9 of the 10 lots. Prevalence ranged from a trace to 21% with an average prevalence of 8.5% for the 9 lots.

Gray mold rot (Botrytis sp.) was found in 6 of the 10 lots. Less than 1% was present in 5 lots and about 3% was present in the sixth.

Other varieties:- The other 9 lots of apples consisted of 2 lots of Cortland and one lot each of Rome Beauty, Northern Spy, Red Delicious, Twenty Ounce, Baldwin, Winter Banana, and Rhode Island Greening.

Orchard scab was found in 6 of the 9 lots. Prevalence ranged from 6 to 100% with an average prevalence of 38% for the 6 lots. One lot of Cortland was 100% severely scabbed and the Northern Spy was 70% moderatly to heavily scabbed. Except for these 2 lots severity was light. Storage scab was present in 4 of the 9 lots. Prevalence ranged from 3 to 24% with an average prevalence of 10% for the 4 lots. The severely infected lot of Cortland was the one also having 24% storage scab. The severity of storage scab was light in all cases.

Blue mold was present in 6 of the 9 lots. Prevalence ranged from a trace to 15% with an average prevalence of 5.5%.

Bitter pit (physiogenic) was found in Rome Beauty, Northern Spy, Baldwin and Winter Banana. Prevalence ranged from a trace (Baldwin) to 14% (Winter Banana) with an average prevalence of 6.5%.

Common scald (physiogenic) was found only in the Rhode Island Greening where the prevalence was about 18% and the severity moderate.

PEARS. One lot of Bartletts of a few hundred bushels representing an initial storage of 1950 bushels was seen in the Holley cold storage. Another lot of 66 bushels of Bosc was seen in the Albion cold storage. Blue mold rot (Penicillium expansum) was present as a moderate to heavy infection on 70% of the Bosc, and as a light to moderate infection on 22% of the Bartlett. The Bosc also had an 8% infection of gray mold rot and a trace of Rhizopus rot (Rhizopus sp.). The Bartlett was about 2% affected with a Mucor and there was also a trace of an undetermined sclerotial forming fungus.

ONIONS. Sixteen lots of onions representing approximately 50,000 bushels were examined in Brockport, Holley and Albion. These were all in cold storage plants where the temperatures ranged from 31.5 to 33° F, and the storage conditions were good. In most cases the total shrinkage to date has averaged from 0.5 to 1.0%. In only one or two lots did the total shrinkage approach 3 or 4%.

Smudge (Colletotrichum circinans) was the most widely distributed disease in the 16 lots. It was present in 15 lots with a prevalence range of 5 to 34%. Average prevalence for the 15 lots was 20%. Severity was recorded as light in 9 lots, moderate in 4 lots, and heavy in 2 lots.

Blue mold rot (Penicillium spp.) was present in 10 lots. Prevalence ranged from a trace to 21% with an average prevalence of 4.5% for the 10 lots. Severity averaged light.

Black mold rot (Aspergillus niger) was present in 5 lots. Prevalence ranged from a trace to 16% with an average prevalence of 8.5% for the 5 lots. Severity was light except in 2 lots where it was moderate.

Fusarium bulb rot (Fusarium spp.) was also present in 5 lots. Prevalence ranged from a trace to 7% with an average prevalence of 3% for the 5 lots.

Gray mold rot (Botrytis spp.) was present in 4 lots. Prevalence ranged from 1 to 10% with an average of 3.5%. Severity was generally light.

Bacterial soft rot (Erwinia spp.) was present in 2 lots. Prevalence was about 0.5% in one case and about 1.0% in the other.

Sour skin (cause unknown) appeared as a trace in one storage in Albion.

In addition to the 16 lots previously mentioned the diseased "throwouts" of 3 other lots were classified as they came from the grader. In each of the 3 lots the total shrinkage did not exceed 0.5%, but the diseases were present in the following proportions:

Lot No. 1 -- Common storage in Albion. Smudge 40%, Bacterial soft rot 29%, Gray mold rot 20%, Blue mold rot 10%, and Sourskin 1%.

Lot No. 2 -- Cold storage in Holley. Blue mold rot 66%, Fusarium bulb rot 13%, Smudge 10%, Black mold rot 7%, Gray mold rot 3%, and Bacterial soft rot 1%.

Lot No. 3 -- Cold storage in Albion. Gray mold rot 74%, the Botrytis byssoidea type was by far the most prevalent, and the B. allii type was more prevalent than the B. squamosa type; only a trace of the last-named type was present), Fusarium bulb rot 13%, Bacterial soft rot 9%, Blue mold rot 3%, and Black mold rot 1%.

CARROTS. Three common storages and one cold storage containing 25,200 bushels of carrots were examined in Medina and Albion. Keeping quality remains good in both types of storages. In 3 of these storages the total shrinkage to date has been less than 1%. In one of the common storages in Medina the shrinkage has approached 2%. Watery soft rot (Sclerotinia sclerotiorum) is the predominant disease seen in most storages. Diseased material collected from the 4 storages was present in the following proportions:

Lot No. 1 -- Cold storage in Medina. Watery soft rot (Sclerotinia sclerotiorum) 46%, Gray mold rot (Botrytis spp.) 21%, Black rot (Alternaria radicina) [Stemphylium radicinum] 18%, Bacterial soft rot (Erwinia carotovora) 10%, Yeasts (probable) 3%, and Fusarium rot (Fusarium spp.) 2%.

Lot No. 2 -- Common storage in Medina. Watery soft rot 29%, Bacterial soft rot 25%, Gray mold rot 23%, Black rot 20%, and Fusarium rot 3%. Traces of Penicillium rot (Penicillium spp.) and a Mucor were also present. This is the storage in which the losses appeared to be greatest.

Lot No. 3 -- Common storage in Medina. Watery soft rot 48%, Black rot 33%, Bacterial soft rot 9%, Gray mold rot 9%, and Penicillium 1%.

Lot No. 4 -- Common storage in Albion. Watery soft rot 97%, Gray mold rot 2%, and Black rot 1%.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

STORAGE DISEASES OF POTATOES AND OTHER VEGETABLES IN MINNESOTA

Ian W. Tervet

During the period from January 2 to January 9, 1945, inspection was made of rutabagas and cabages in storage in north-east Minnesota, and of potatoes in northern Minnesota. The writer was accompanied by R. C. Rose, Extension Plant Pathologist, University of Minnesota.

CABBAGE. Relatively little cabbage remained in storage in the Wrenshall area, recent high prices making for rapid movement of the crop to market. Those cabbages seen were in good shape. A trace of black rot (Xanthomonas campestris) occurred, while in one house black leaf speck was found on a few plants. Some decay of the outer leaves was resulting from Rhizopus soft rot, but over-all loss in storage was negligible.

RUTABAGAS. Rutabagas in storage at Askov were keeping somewhat better than in the previous season. Some loss from storage rot had resulted. Most of the decay was due to Alternaria herculea, some lots having many roots heavily infected. Fusarium dry rot was less common than Alternaria while black rot (Xanthomonas campestris) was of still less importance at the present time.

POTATOES. Warehouses were examined at East Grand Forks, Nielsville, Halstad, Moorhead, Sabin, Baker, Glyndon, Lake Park and Aitkin. Many of the warehouses were very wet, some recently built storage houses being among the worst. In a few houses some sprouting was occurring; hair sprout, and varying degrees of weak sprouts were found in bins of Triumphs and Pontiacs. It is not possible at the present time to estimate the percentage of weak sprouts in stored potatoes, but tests made by the Minnesota

Seed Potato Inspection Office does not suggest that hair sprout will be of great importance this year.

Dry rot (Fusarium sp.), late blight (Phytophthora infestans) and ringrot (Corynebacterium sepedonicum) were found in all commercial potatoes, indications being that loss in storage is above average. Some stocks will continue to break down relatively rapidly and should not be kept in storage much longer. The prevalence of ringrot has unquestionably increased during the last season.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

STORAGE DISEASES OF POTATOES AND ONIONS IN IOWA

Edgar F. Vestal

POTATO. Iowa's potato crop for 1944 was the lowest in acre yield for some seasons. The average yield per acre was 65 bushels, which is 32 bushels below that for 1943 and 20 bushels below that for the period 1931-41. Heavy early season rains causing late planting in many cases were mostly responsible for the low yield.

A large percentage of the Iowa crop went into storage at digging time, although there was a heavy sale directly from the field. Commenting on the early sale one prominent grower said that he sold as many potatoes in November as he usually sold in February. His explanation, which bears out the observations made during surveys, was that the home garden potatoes were so poor this past season that people were forced to buy early who usually had enough potatoes from their gardens to last them until after the new year.

Weather conditions were favorable for most of the digging period and potatoes went into storage in good condition. The most severe losses in 1944 were from tipburn and hopperburn, and scab [Actinomyces scabies]. The former caused severe damage to early potatoes. Infection with scab was general, varying from a trace to as much as 100% of the tubers affected. The most severely infected fields were found in the northwest from Winnebago County west and south. Very little scab was seen in the Mitchell County area.

Dr. G. C. Kent, who inspected some 56,500 bushels of potatoes for certification this past fall, estimated the total injury from virus diseases as approximately 12%. This would include rugose mosaic, purple top, leaf roll, spindle tuber, and other less easily differentiated virus diseases.

Late blight, while appearing as a mild epiphytotic toward the end of August, did not cause much damage to the tubers. Most of the late blight occurred in the north central region of the State. None was seen from St. Ansgar in Mitchell County eastward. The potatoes were well on their way to maturity when late blight appeared and in only a few cases did more than 1 or 2% of the tubers show infection at digging time.

ONION. The same factors that caused a poor potato crop for Iowa this past season also caused a reduction in the yield of onions. During the survey of the potatoes in storage, some 15,000 bushels of onions were also examined. Neck rot was the most serious disease observed and amounted to some 15% of the onions. In the Fertile area smut was serious in one or two fields but these diseased onions were not put into storage and very

little smut was observed during the survey. Pink root was common both in the field and in storage. The overall loss from the two diseases, would, however, be little more than a trace.

In one storage house at St. Ansgar, some 4,500 bushels of onions out of about 13,000 were sprouting. The balance were keeping in good condition. The grower attributed the sprouting to the lack of maturity at time of harvesting.

From the condition of the onions and potatoes seen on the survey, it would seem that very little loss from rot need be expected during storage this season.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

POTATO STORAGE DISEASES IN WISCONSIN

Edwin E. Honey

During November 24 to December 2, inspections were made of potatoes stored in about 40 commercial warehouses in Marquette, Waushara, Portage, Waupaca, Marathon, Oneida, Langlade, and Marinette Counties. Only locally-grown potatoes were stored in 32 of these warehouses, only western-grown in 4, and both local and western potatoes in the other 4.

Summary. (1) The number of potato warehouses and dealers operating in Wisconsin is much less this year than last. This reflects the greatly decreased potato acreage and crop for season of 1944. (2) Wisconsin varieties of potatoes encountered in commercial warehouses at this time were Cobbler, Triumph, Chippewa, Red and White Warba, Pontiac, Early Ohio, Katahdin, Green Mountain, Sebago and Sequoia. Western-grown potatoes were chiefly Cobbler and Triumph with a few Early Ohio. (3) The growing season continued unusually late this year resulting in immaturity, some secondary growth, growth cracks, or ill-shaped tubers in late varieties. It also favored bad feathering and darkening of skin especially with the Chippewa variety, thus lowering quality. (4) The extremely late growth of the vines this year has stimulated the earnest interest of many growers in some killer in order to shorten the growing period, mature the tubers before digging, and avoid the danger from Late Blight and freezing. (5) Potato tubers harvested early (August) completely escaped Late Blight infection but some of these were found to be sprouting, indicating the relatively high temperatures in storage obtaining during the late warm fall. Spindle sprout should be tested for in all seed lots. (6) The hot drought period occurring in many Wisconsin potato growing areas in 1944 reduced the yield in many cases and favored heavy Scab infection. Irrigation is reported to have reduced Scab in some areas through lowering of soil temperatures and increasing soil moisture. The acreage coming under irrigation is increasing but such irrigation has to be used with caution. (7) The relatively late warm fall and the labor shortage made it difficult to ventilate and cool storage houses adequately after harvest and the resultant heating, supplemented by immaturity and Late Blight infection, resulted in severe loss in late harvested varieties. (8) The shortage and quality of labor also aggravated the situation since many affected potatoes, which should have been eliminated during the harvesting operation, were brought into storage. (9) While some rains occurred in Central Wisconsin favoring

Late Blight infection there were no heavy driving rains to carry inoculum into the soil and for the most part conditions were favorable for harvesting. The amount of tuber infection varied with the consistency of the spray program followed and the good fortune in harvesting under dry conditions.

Central Wisconsin. Approximately 30 warehouses were inspected in this area, Marquette (1), Waushara (3), Portage (15), Waupaca (9) and Marathon (2) Counties. One dealer in Marquette County and one in Marathon County were buying locally and selling chiefly to truckers. Chippewa potatoes in these warehouses revealed a moderate amount of Late Blight (Phytophthora infestans) with little loss at the warehouse.

Very severe loss from wet rot following Late Blight tuber rot in Chippewa and Cobbler potatoes was found in 2 warehouses in Waushara County. Large potato cull piles had been dumped near these warehouses. The trouble appears to have been aggravated by late growth in the fall, immaturity, feathery skins, and difficulty in temperature and ventilation in storage because of the relatively warm fall weather. One dealer in this county, having disposed of Cobbler and Chippewa, was experiencing very little loss in storage with Red Warba and Triumph.

In Portage County, of 15 warehouses inspected 13 stored only locally-grown potatoes with the exception of one in which was found a carload of Maine certified seed. Two houses contained western potatoes only. The greatest loss observed was found in one warehouse in which about 13 carloads of western potatoes from certified fields had been stored. These potatoes went down so severely with Wet Rot following heavy Late Blight tuber rot that they had to be completely discarded, a probable $20,000 loss. Conditions leading to such loss were (1) the late seasonal appearance of Late Blight, (2) late growth of the potato vines, (3) unfavorable weather (heavy rains) at harvest time resulting in the adhesion of much dirt and inoculum to the harvested tubers. These potatoes were shipped in sacks as harvested, heating in transit, stored without grading, and with the difficulty with ventilation and temperature in the warehouse because of the warm fall, soon went down as a total loss. Common stock of Cobblers and Early Ohio from the west harvested in other locations, while having severe Late Blight tuber rot was standing up better than that from certified fields.

In Waupaca County, warehouses storing western potatoes had similar difficulty with certain lots but these had been in lesser amounts and graded and shipped out or disposed of. Less loss in western potatoes in Waupaca County appeared to be due to the fact that, in general, on arrival the potatoes were graded before being put into the bins. At the time of inspection in several warehouses crews were at work sorting potatoes in certain bad spots or in bins that appeared to be going down but entire bins were not becoming a complete loss as was found in the Portage County warehouse. It was evident that care in ventilation and temperature control along with grading the field run and taking out much of the dirt before putting into bins resulted in much better keep of the stored potaotes.

In Marathon County western potatoes received were found to vary considerably in the amount of Late Blight. Some lots were free or but slightly affected, other lots were severely affected. No general wet rot was observed in the bins and the affected lots were being graded and disposed of.

Ringrot in western common-stock Cobblers was observed in traces in two warehouses in Portage County and in greater amount in one bin in one warehouse in Waupaca County. These were being graded and shipped out at the time of inspection.

In general, locally grown potatoes have not resulted in such severe loss in the warehouses as that found with western potatoes; however, Sequoia, Sebago, Chippewa, Katahdin, and some Pontiac in particular, have shown severe Late Blight tuber rot. As a rule by the time locally grown tuber rot potatoes reached the warehouse they remained dry rather than going down in severe wet rot. Sequoias had been found severely blighted, over size, and badly affected with Hollow Heart in most cases. However, one lot observed in Marathon County appeared free of Late Blight (had been sprayed 11 times) and there was relatively a small amount of over size and hollow heart.

Most warehouse men in this area buy and sell locally grown potatoes as "unclassified". They do not attempt to store but move them along as fast as possible. Some warehouse men had taken considerable losses on shipments during the month of September. Earlier and later shipments were better. It is probable that growers receive at least a 50% loss from Scab and Late Blight turned back to them at the warehouse.

In general, Red Warba, Triumph, and Pontiac were standing up well in storage, probably because of the early harvest, thus escaping all or most of the Late Blight infection. However, some bins of Red Warba, Cobblers and Chippewas harvested early (August) and found free of Late Blight in several warehouses were beginning to sprout considerably showing the influence of the warm fall storage. Spindle sprout has been reported in certain potato lots. It should be watched for in all seed stock and if possible tested for and eliminated before planting.

Northern Wisconsin. Six warehouses were inspected in the Northern Wisconsin area including Langlade (2) and Oneida (4) Counties.

In Langlade County most of the potatoes still in warehouses at time of inspection were certified seed. Two warehouses with locally grown common stock potatoes were inspected. Potatoes in these warehouses were in good condition showing no Late Blight and very little Scab. Most of the non-certified potatoes had been shipped.

One warehouse only in Onedia County was found to have western Cobblers that had been received in sacks as dug. The western potatoes appeared to be keeping well. In this same warehouse some field frost and storage rot was found in locally grown potatoes in a few bins but, in general, potatoes appeared to be storing well.

Northeastern Wisconsin. Five warehouses in Marinette County were inspected, all handling locally-grown potatoes. A considerable amount of Late Blight and Scab was found in the bins but it appeared dry and not breaking down rapidly. It is probable that Late Blight was not so severe in this area as in Central Wisconsin. A severe hot drought period during the summer appears to have favored Scab and reduced the yield considerably. Dealers were buying and shipping commercial grades although few no. 1, and not storing for any length of time. Immaturity and bad feathering of skins, especially on Chippewa was conspicuous and some field frost also occurred in this county.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

OTHER REPORTS ON DISEASES OF STORED POTATOES AND SEED POTATOES

Reports are of Emergency Plant Disease Prevention Project surveys.

POTATO STORAGE DISEASES IN OHIO: Potato storage houses in Champaign and Clark Counties of Ohio were visited during the latter part of the week. Although the Katahdin was the chief variety being stored several of the storages contained smaller quantities of Sebagos. The potatoes in this area are being moved to markets as rapidly as possible because of the demand resulting from the snow-blocked road conditions that prevailed throughout most of the state during the latter part of December and the first two weeks of January.

In one lot of Katahdin approximately 20% of the tubers were infected with the scab organism (Actinomyces scabies). Another lot showed about 5% scab damage. All growers reported satisfacotry control of late blight (Phytophthora infestans) by the use of 10 to 15 applications of bordeaux mixture. None of the lots examined showed more than 1% late blight infection on the tubers. Fusarium rots (Fusarium spp.) accounted for an approximate 2 percent loss in one bin of Katahdins. Most of the potatoes in storage were from irrigated fields. Approximately 1 to 3% of the tubers from the irrigated plantings were affected with hollow heart (physiological) and 2 to 5% showed growth cracks (physiological).

In the bins inspected to date there has been but little apparent spread of rot resulting from contact of diseased with healthy tubers. This may be attributed to the fact that the mean daily temperatures in this part of the state during the months of December and January have been favorable for storage. In general sprouting was not excessive and the condition of the healthy tubers in all storages was excellent. -- Alvin J. Braun, Jan. 15-20.

DISEASES IN SEED POTATOES IN CALIFORNIA: A number of sheds were visited in Kern County where seed potatoes were being cut and treated prior to planting. Diseases observed on seed pieces were: Hollow heart (non parasitic), Scab (Actinomyces scabies), Rhizoctonia disease (Corticium vagum), rots resulting from bruises and cuts, enlarged lenticels (non parasitic), and dry rot (Fusarium sp.). -- Henry Schneider, Dec. 17-18.

WATER ROT OF POTATOES

Earle C. Blodgett

During surveys of Idaho potato fields and storages in 1943, the writer frequently was directed to certain lots of potatoes affected by what was popularly called "water rot". The experience was repeated many times in 1944.

The term "water rot" was new and apparently the serious aspect of the disease was also new. It was, of course, natural to attempt to discover the cause of the condition and to trace somewhat the history of this interesting disease.

The writer is indebted to Mr. John L. Toevs, Superintendent of the Aberdeen Branch Station, and to Dr. James E. Kraus, formerly in charge of potato research at Aberdeen, for most of the information on history, and

to Dr. W. W. Ray, Mycologist, Emergency Plant Disease Prevention, Stillwater, Oklahoma, for isolation of a fungus that apparently is the causal agent. Dr. Ray found that the fungus readily produced a water rot of inoculated tubers.

A watery soft rot of potatoes in Idaho has long been known to occur occasionally on tubers at digging time in low, wet, poorly drained areas in irrigated fields. Often waste water stands in these places and the soil is saturated. It is questionable, however, whether this rot is the same as the one now under consideration, which came into prominence in the 1941 season in the area around Aberdeen and accounted for very serious losses in several fields. These experiences probably resulted in the establishment of the term "water rot" and the general picture now is that this condition has become rather widespread and accounts for important losses. Those who have been most closely associated with potato growing and have observed "water rot" the last three years have considered the initial rot physiological, due principally to a lack of aeration with secondary "infection" through the enlarged lenticels. The disease has been regarded as confined entirely to fields irrigated excessively, where drainage is poor on soils having high water holding capacity, and where earth worms are abundant. The presence of large numbers of earthworm tunnels makes it difficult to avoid applying too much water, and under such conditions the ground easily becomes supersaturated.

Observations by the writer and considerable inquiry into typical cases, however, led to the belief that the conditions noted above were likely only predisposing factors such as moisture and temperature requirements are in rust epidemics. Repeated isolations from typical samples have yielded a fungus that has been identified by Dr. Ray, and by Dr. C. M. Tucker, Department of Botany, University of Missouri, as Phytophthora erythroseptica Pethybr. The active parasitism by this fungus is readily understandable when such environmental conditions prevail as have been described. There seems little doubt but what excess moisture is a prerequisite for extensive damage, as it is in other diseases caused by similar fungi.

Of very great importance is the question of tuber transmission and of build-up of inoculum in the soil. It is well established that water rot may be present at digging time and that as much as 50% of tubers may show symptoms as they are dug. Evidence indicates that most infection occurs in the field, not in storage, although the amount of rot increases usually after tubers are stored. Contrary to the general information already discussed, water rot has been very severe in locations where soil is rather sandy and loose, where drainage apparently is adequate, and where tubers do not show other evidence of excessive moisture (skin and lenticels are normal). Also, it has been seen in fields never before planted to potatoes, but very heavily fertilized with manure. Probably of considerable significance, too, is that in several cases observed where water rot was very severe, the land had either been fertilized very heavily with sheep manure or had been the site of wintering sheep. Fields which had been in alfalfa with the knee-high hay plowed under, followed by abundant irrigation, seemed to show more water rot than low fertility fields. Under such conditions of high organic content in soil, water penetration is often very rapid and the amount applied is often excessive.

Typically, water rot has the appearance of certain forms of frost injury. The outer tissue near the stem end (in nearly every case examined) has a black or dark brown, water-soaked appearance, and the rot at first extends only a short distance into the tuber. The inner rotted tissue is at first a dirty, creamy white, and seems to be leathery. Later it becomes darker brown and has a mushy consistency. Of characteristic occurence is the "slipping" of the skin showing dark bodies on the underside of the skin. The writer has observed no other disease affecting potatoes which causes this separation of skin from the tuber in a similar way. In many cases the outer shell may be sloughed off exposing a core of apparently unaffected tissue. Affected cut tubers, when exposed to the air, turn a pink color. The eyes become darkened and dead before the outer tissue indicates that a rot is present. It is not known whether the foul odor of fermentation is characteristic of water rot or is due to secondary organisms. The rot is very wet and when at all prevalent makes a very messy and unattractive pack. There is considerable similarity between tubers affected by water rot and those affected by late blight although late blight is not known to occur in Idaho.

So far as can be learned, the term "water rot" is not found in the literature, nor is it generally known elsewhere except the very recent reports by Tervet[1] on a "water rot" occurring in the Red River Valley of Minnesota. The importance of the disease in Idaho at the present time and the potentialities of the disease strongly suggest that much more information is desirable and perhaps necessary in order to prevent serious losses.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

DOES THE SEQUOIA VARIETY OF POTATO POSSESS RESISTANCE TO LEAF ROLL VIRUS AND TO FROST?

G. K. Parris

The potato varieties Sebago and Sequoia were introduced into Tidewater Virginia some 5 years ago, and soon established themselves owing to their ability to withstand the high temperatures prevailing during July and August. Sebago was preferred over Sequoia because of its better baking qualities, smoother skin, shallower eyes, and more uniform shape. Although late-blight resistance of Sebago has never been tested locally, for this disease is seldom a problem in fall-grown potatoes, this characteristic was always mentioned in comparing the 2 varieties. However, it may be significant to note that Eddins et al. have recently reported that neither variety possesses resistance to Florida strains of Phytophthora infestans (Mont.) de Bary[1].

Where local growers have saved their own seed it has been noted that Sequoia consistently outyields Sebago. In 1942, the writer found that Sebago plantings contained 30 to 40% leaf roll virus, and lesser amounts

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[1] Tervet, Ian W. Potato storage in the Red River Valley of Minnesota. PDR 28: 1084-1085. 1944.

[1] Eddins, A.H., E.N. McCubbin, and F.G. Stevenson. Results of potato variety tests at Hastings, Florida. Amer. Pot. Jour. 21:269-277. 1944.

of mosaic and spindle tuber viruses. No data on the virus content of Sequoia were obtained. Growers again planted homegrown seed in 1944 and the percentage leaf roll in Sebago jumped to between 75 and 100% in most fields seen this fall. The disease could be found in all stages of development, ranging from marked stunting to little reduction in plant size, always accompanied by rolling of the leaves in varying degrees. Over 100 individual hills were dug, half of them from plants that showed what appeared to be seed-borne leaf-roll infection, the other half from plants that showed what was ascribed to current-season infection with the virus. Tuber weights revealed that severely diseased hills yielded approximately 42% less than hills only slightly affected with the virus. When the dirt was washed from the tubers another feature was revealed, namely that a difference in variety existed, for tubers from hills classified as little affected by the virus were those of the variety Sequoia, while tubers from stunted plants invariably were those of Sebago. It is not known when this mixing took place, but it is believed that both varieties had been exposed to the leaf roll virus for equal periods of time. Additional work, involving inoculation and tuber-indexing studies are needed before the differences in yields between Sebago and Sequoia noted this year and in past years can be ascribed to the effect of the leaf roll virus. The fact remains, however, that Sebago seems to react more violently to this virus than Sequoia and that the latter outyields Sebago.

A second advantage of Sequoia over Sebago was demonstrated this fall when Sequoia withstood 2 rather severe frosts, while nearby Sebago plants were badly "burned" by the low temperature. Whether the Sebago succumbed because it was weakened by the presence of the leaf roll virus, or the Sequoia was not injured because it is tolerant to the virus, remain unsolved questions.

VIRGINIA TRUCK EXPERIMENT STATION, NORFOLK, VIRGINIA

A CANKER OF COWPEA AND MACROPHOMINA LEAF SPOT OF COWPEA AND SNAP BEAN

J. L. Weimer and E. S. Luttrell[1]

A canker of undetermined etiology on cowpea and a leaf spot of cowpea and snap bean caused by Macrophomina phaseoli (Maubl.) Ashby were observed for the first time in Georgia during 1944. Although M. phaseoli occurs commonly on stems and pods of both cowpea and snap bean, to our knowledge it has not been recorded previously on the leaves of either plant.

Cowpea Stem Canker. A disease of cowpea, the most conspicuous symptom of which was a canker approaching brick red in color on the petioles and stems, was found causing the death of a considerable number of plants at Experiment, Georgia in September. Early stages of the disease were not found, but plants available for examination showed cankers varying in size from a few mm in each dimension to practically the entire length and diameter of the stem. Apparently infection can take place anywhere along the petiole or stem, so that branches only or the entire plant may

[1] Senior Pathologist, Division of Forage Crops and Diseases, and Associate Botanist, Georgia Agricultural Experiment Station, respectively.

be killed. Adjacent cankers may coalesce, involving large areas of the stem. The disease was not observed until the plants had reached the blossoming stage; hence it is not known if they are susceptible in the earlier stages of growth.

An examination of many of the cankers revealed the presence of several fungi. A species of Colletotrichum, which appeared to be most common, at times fruiting abundantly on the surface of the lesions, was thought to be the most probable causal agent, although a species of Fusarium and one of Phomopsis (probably Diaporthe sojae Lehman) frequently were found. Bain (PDR 28(13): 1010-1011, Sept. 7, 1944) reports a canker at the base of cowpea stems on which a species of Glomerella or Physalospora and 2 species of Colletotrichum were found. One species of Colletotrichum had curved spores and is listed as possibly C. caulicolum Heald & Wolf. The Colletotrichum associated with the cankers herein described had curved spores resembling those of C. caulicolum also, but positive identification is lacking. Walker (PDR 28 (21): 687, July 15, 1944) also reports a Colletotrichum sp. and a Phomopsis sp. on cowpea in Maryland but does not describe the nature of the damage caused.

Cowpea Leaf Spot. Following a rainy period in September, a considerable number of leaflets of an unknown variety of cowpea were seen dying from the tip towards the base. In some leaflets the disease had progressed only a short distance back from the tip, whereas in others half or more of the leaflet was involved. The affected tissue was dead, light brown to almost gray in color, and contained many small black pycnidia. The tissue immediately adjacent to the diseased area was more or less water-soaked in appearance. The dead distal end of the leaflet usually curled up and often back over the upper side of the leaflet. All of the tissue, including the veins, appeared to be equally susceptible, so that the leaflet was killed back fairly uniformly. All of the discolored and some of the greenish tissue adjacent to the brown was more or less uniformly filled with pycnidia, there being as many as 1000 per square centimeter of leaf area. Some of the pycnidia contained large, hyaline, non-septate spores resembling those of Macrophomina phaseoli. A fungus was consistently isolated from the tissue near the margin between the diseased and healthy areas, and cultural studies confirmed the identity of the fungus involved as M. phaseoli. No inoculations have been made.

Later observations showed that the infected leaflets soon fell off and that the infection did not spread either to new leaflets or into the petioles or stems. Only one or at most a very few of the younger leaflets on a plant were attacked. Two weeks after the outbreak was first seen no signs of the disease could be found.

Similar infection of leaflets of potted cowpea plants was observed in the greenhouse. Under these conditions the fungus often entered the stem through the petioles of diseased leaves. Stem infection resulted ultimately in the death of the entire plant.

Snap Bean Leaf Spot. M. phaseoli leaf infections occurred throughout the summer on snap bean plants grown in pots in the Georgia Experiment Station greenhouse. The fungus commonly entered the nodes through diseased petioles, producing typical symptoms of ashy stem blight and finally causing the death of the entire plant.

The first leaf infections observed in the field were found in a planting of mature hybrid snap beans at Experiment during July. Leaf spots were present only on an occasional plant. Infection was more severe, however, in a field of similar snap beans at Tifton, Georgia during August. The beans there had been planted late because of an unusually wet spring, had been weakened by drought just after blooming, and were undergoing a period of wet weather at the time observations were made. Although only a few pods had matured and dried, many of the plants were already moribund. The leaves of almost every plant were infected with either M. phaseoli or Phyllosticta phaseolina Sacc., and M. phaseoli appeared to be responsible for more than 50% of the leaf spotting. Infection of the snap bean leaflet is first apparent at the margins, generally near the apex of the leaflet. The infected tissue becomes dry and brown to form an irregular, unbordered spot. The dead tissue is covered with the black pycnidia of M. phaseoli. Beyond the margin of the spot a reddish-brown discoloration of the veins, especially noticeable on the lower surface, advances toward the base of the leaflet. Gradually the intervenous tissue becomes brown, and the spot increases in size until the entire leaflet is involved. If the leaf clings to the plant, the fungus may advance down the petiole and enter the node, causing infection of the stem. Isolations from pycniospores from infected leaves at both Experiment and Tifton produced the characteristic sclerotial stage (Sclerotium bataticola Taub.) in culture. DIVISION OF FORAGE CROPS AND DISEASES, U. S. BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, AND GEORGIA AGRICULTURAL EXPERIMENT STATION

SOME CORRECTIONS

FUNGUS CAUSING LEAF SPOT OF SORGHUM IN OKLAHOMA: Howard W. Larsh writes that on page 964 of the October 1 issue (Vol. 28, no. 31, 1944) the name of the organism causing leaf spot of sorghum was given as Septorella sorghi instead of as Titaeospora andropogonis, the correct causal fungus.

TEMPERATURE INDICES AT ILLINOIS STATIONS: Designation of the respective winters was omitted from Figure 3, accompanying N. E. Stevens' article in PDR Supplement 152, page 11. The left hand map was for the winter of 1942-43, the right hand map for that of 1943-44.